

1 **THE EMBODIMENTS OF THE INVENTION IN WHICH AN**
2 **EXCLUSIVE PROPERTY OR PRIVILEGE IS BEING CLAIMED ARE DETAILED**
3 **AS FOLLOWS:**
4

5 1. A process for treating a wellbore having openings in
6 communication with a damaged formation comprising:

7 running in a tubing string into the wellbore to position a propellant
8 carrier adjacent the openings;

9 overbalancing the wellbore with liquid to establish hydrostatic pressure
10 on the formation;

11 igniting the propellant so as to produce a pressure event and a volume
12 of gas directed into the formation;

13 injecting low density foam through the tubing string and into the
14 wellbore at a location above the propellant carrier so as to reduce the hydrostatic
15 pressure and produce at least some debris from the formation and into the wellbore;
16 and

17 conveying the debris from the wellbore by circulating the foam out of
18 the wellbore to at surface until sufficient debris is removed.

19
20 2. The process for treating a wellbore of claim 1 wherein
21 overbalancing the wellbore further comprises filling the tubing with liquid.
22

1 3. The process of claim 1 wherein the injecting of foam step further
2 comprises lowering the location for injecting the foam from above the openings to a
3 location below the openings.

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5 4. The process of claim 3 wherein the injecting of foam step further
6 comprises continuously injecting foam while lowering the location of injecting the
7 foam.

8

9 5. The process of claim 3 wherein the injecting of foam step further
10 comprises stroking the tubing string to periodically alternate the location of injection
11 of the foam from below the openings to above and returning to below the openings.

12

13 6. The process of claim 1 where the propellant ignition step further
14 comprises:

15 providing a lubricator having a drop bar and a trigger; and

16 triggering release of the drop bar to fall through the tubing string to the
17 propellant carrier for actuating ignition of the propellant.

18

19 7. The process of claim 6 wherein the injecting of foam step further
20 comprises opening a port in the tubing string above the propellant carrier actuated
21 by the falling drop bar for injecting the low density foam therethrough.

22

1 8. The process of claim 7 wherein the injecting of foam step further
2 comprises lowering the port from a location above the openings to a location below
3 the openings.

4

5 9. The process of claim 8 wherein the injecting of foam step further
6 comprises continuously injecting foam while lowering the location of injecting the
7 foam.

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9 10. The process of claim 7 wherein the injecting of foam step further
10 comprises stroking the tubing string to periodically alternate the location of injection
11 of the foam from below the openings to above and returning to below the openings.

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14 11. The process of claim 1 where the propellant ignition step further
15 comprises pumping liquid into the tubing string to a first pressure for actuating a
16 pressure actuated firing head for actuating ignition of the propellant.

17

18 12. The process of claim 11 wherein the injecting of foam step
19 further comprises pumping liquid into the tubing string to a second pressure for
20 actuating a pressure-actuated plug to open a port in the tubing string above the
21 propellant carrier for injecting the low density foam therethrough.

22

1 13. The process of claim 1 further comprising killing the wellbore
2 and removing the tubing string.

3

4 14. A process for treating a wellbore perforated into a formation
5 comprising:

6 placing a tubing string into the wellbore having at its distal end,

7 a propellant carrier containing propellant; and

8 means for injecting foam in the wellbore;

9 positioning the propellant carrier adjacent the openings;

10 overbalancing the wellbore;

11 igniting the propellant so as to produce a volume of gas sufficient to

12 dislodge debris in the formation;

13 injecting low density foam into the wellbore adjacent the openings

14 using foam injecting means; and

15 circulating the foam into and out of the wellbore for removing debris out

16 of the wellbore.

17

18 15. The process of claim 14 further comprising killing the wellbore
19 and removing the tubing string.

20

21 16. The process of claim 14 further comprising injecting the foam
22 through a port in the tubing string adjacent the propellant carrier.

23

1 17. The process of claim 16 further comprising lowering the port to
2 a location below the openings immediately after the foam injection is initiated.

3

4 18. The process of claim 17 further comprising the raising and
5 lowering of the tubing string periodically while circulating foam so as to prevent a
6 blockage of debris forming between the tubing and the well casing.

7

8 19. The process of claim 18 further comprising raising the port
9 above the openings once an acceptable rate of production from the formation is
10 achieved.

11

12 20. Apparatus for treating a wellbore having an opening in the
13 casing which are in communication with a damaged formation comprising:

14 a tubing string in the casing and extending downhole from surface for
15 positioning a propellant in a propellant carrier adjacent the openings and forming an
16 annulus between the tubing string and the casing;

17 means for igniting the propellant; and

18 means for injecting and circulating foam from an injection location
19 adjacent the openings, up the annulus and out of the wellbore.

20

21 21. The apparatus of claim 20 further comprising:

22 a pup length of tubing at the top of the tubing string;

23 a seal between the wellbore and the pup length of tubing; and

1 means for raising and lowering the pup length of tubing and the tubing
2 string so as to move the injection location between a location above the openings to
3 a location below the openings.
4

5 22. The apparatus of claim 20 where the means for igniting the
6 propellant comprises:

7 a lubricator at surface atop the tubing string and having a drop bar
8 releasably retained therein; and

9 a firing head at the propellant carrier and actuable to ignite the
10 propellant when the drop bar is released to fall down the tubing string to the
11 propellant carrier.
12

13 23. The apparatus of claim 22 where the lubricator further
14 comprises a trigger so as to release the drop bar.
15

16 24. The apparatus of claim 20 where the means for circulating foam
17 comprises:

18 a foam injection inlet in the tubing string at surface;

19 a port in the tubing string adjacent and above the propellant carrier;

20 and

21 a foam discharge port from the annulus at surface.
22

1 25. The apparatus of claim 24 wherein the port further comprises a
2 differential fill flow sub for blocking communication between the tubing string and the
3 annulus until circulating foam.

4

5 26. The apparatus of claim 24 wherein
6 the means for igniting the propellant comprises a lubricator at surface
7 atop the tubing string and having a drop bar releasably retained therein; and a firing
8 head at the propellant carrier and actuable to ignite the propellant when the drop bar
9 is released to fall down the tubing string to the propellant carrier;

10 the lubricator further comprises a trigger so as to release the drop bar;

11 and

12 the port further comprises a differential fill flow sub for blocking
13 communication between the tubing string and the annulus and actuable with the
14 drop bar for circulating foam.

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